

# Exploring outcomes and assessing tradeoffs of co-developed sustainable future scenarios for the Central Arizona-Phoenix region

## Why Develop Sustainability Scenarios?

- The future development of cities requires collaborative approaches addressing planning & management needs
- Combining knowledge networks through researchers & practitioner collaboration enhances research & decision-making capacity for long-range sustainability & resilience planning
- Scenarios provide use-inspired knowledge to explore complex & changing interactions between people, infrastructure, land, water, energy & climate

## Key Features of the Scenario Workshop Series:

- **Co-development:** Moving beyond just allowing relevant stakeholders to provide input → stakeholders collaborate as full partners
- **Multiple Futures Approaches:** Coupled forecasting & backcasting allows us to explore a variety of pathways to a sustainable & resilient future
- **Capacity Building:** Starting with simple tasks (e.g., qualitative systems maps) & iteratively build capacity for more complex tasks (e.g., participatory modeling)
- **Knowledge Integration:** Synthesize different sources & types of knowledge

## Phases of the Workshop Series

### Scoping the Process

Initial scoping meetings were conducted with stakeholders & researchers to identify:

#### a. Co-developed project objectives:

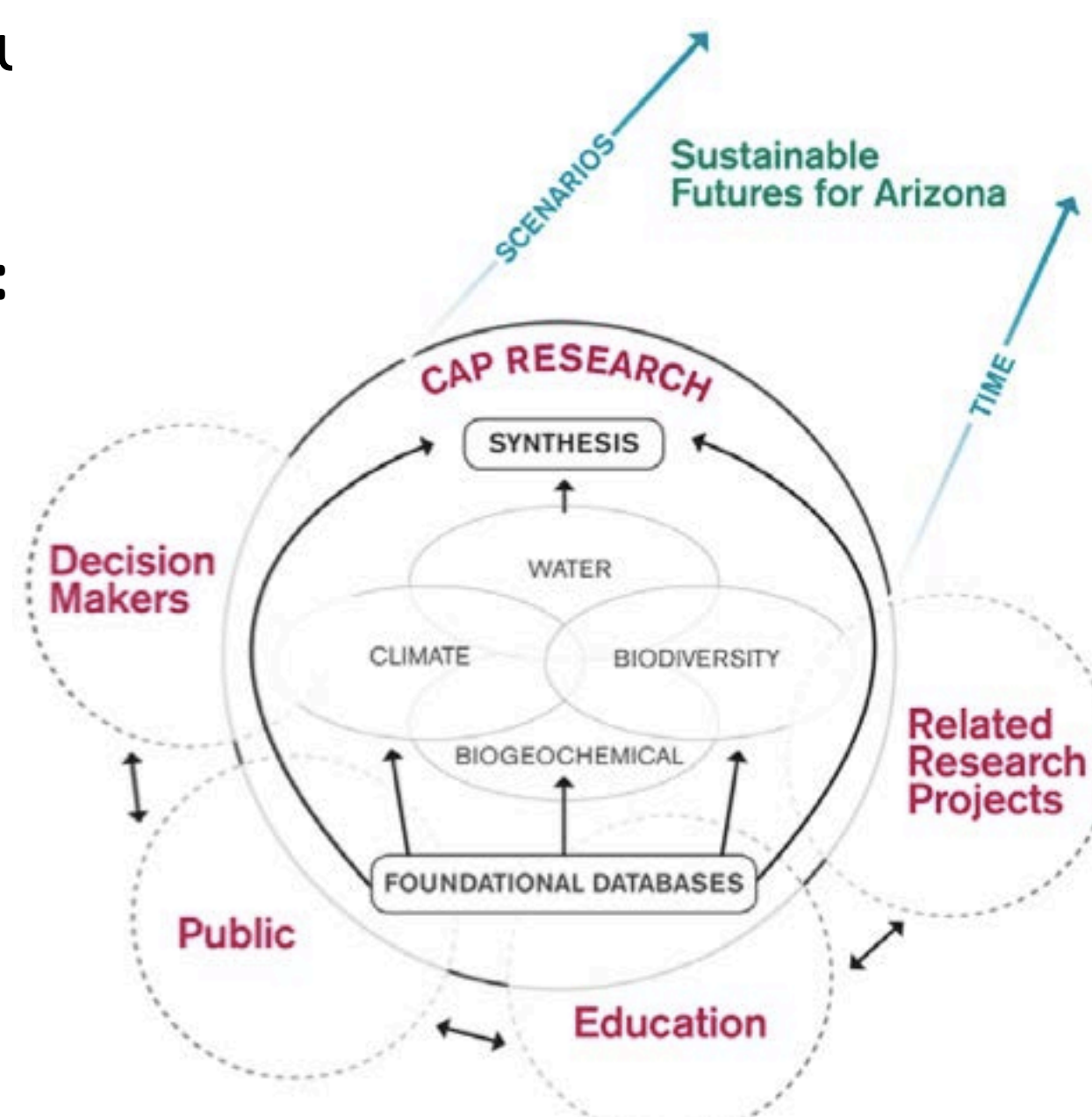
- Synthesis & future research
- Understand conflicts & trade-offs
- Explore sustainable & resilient futu
- Guide decision-making

#### b. Partners co-developing scenarios:

Over 50 leaders & decision-makers from federal, state, county, tribal & municipal departments, academic representatives & NGOs representing different communities & interests.

#### c. Temporal & spatial scales:

- Current state – 2060
- Phoenix metropolitan region
- Multi-level interventions (household to regional scale)



## Framing the Futures:

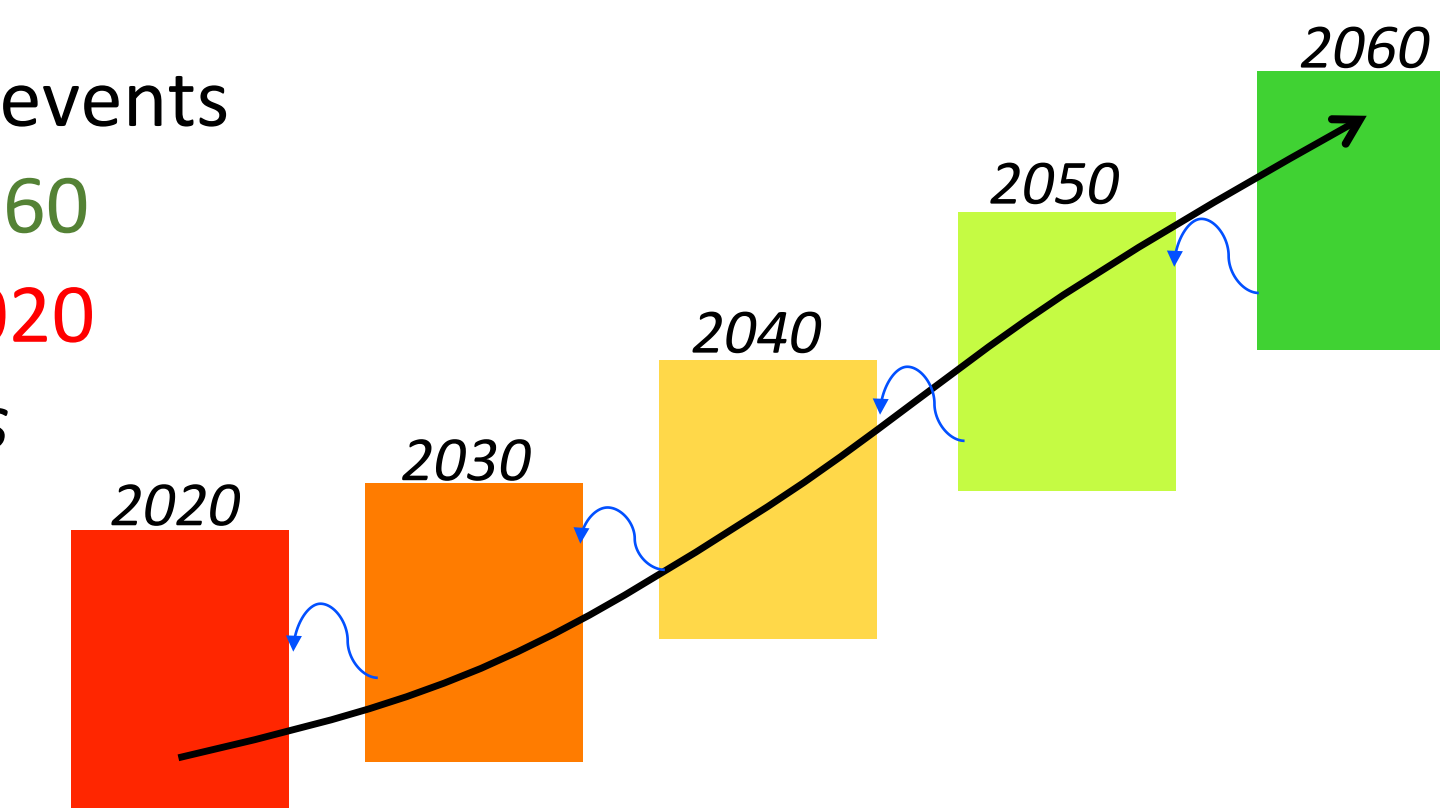
- **Adaptive scenarios** of resilient futures in response to extreme events (heat, drought, flood)
- **Strategic scenarios** of plausible futures from existing governance documents
- **Transformative scenarios** of radically transformed sustainable futures
- ✓ **Outcomes:** 7 distinct scenarios: 3 adaptive, 1 strategic, & 3 transformative scenarios

## Initial Pool of Scenarios:

- Elicit key variables from scenarios & develop systems maps to identify relationships among variables
- Conduct rapid sustainability & resilience appraisals
- Craft actor-oriented narratives for each scenarios
- ✓ **Outcomes:** Partner report of potential strategies & solutions that served as the building blocks for our core scenarios

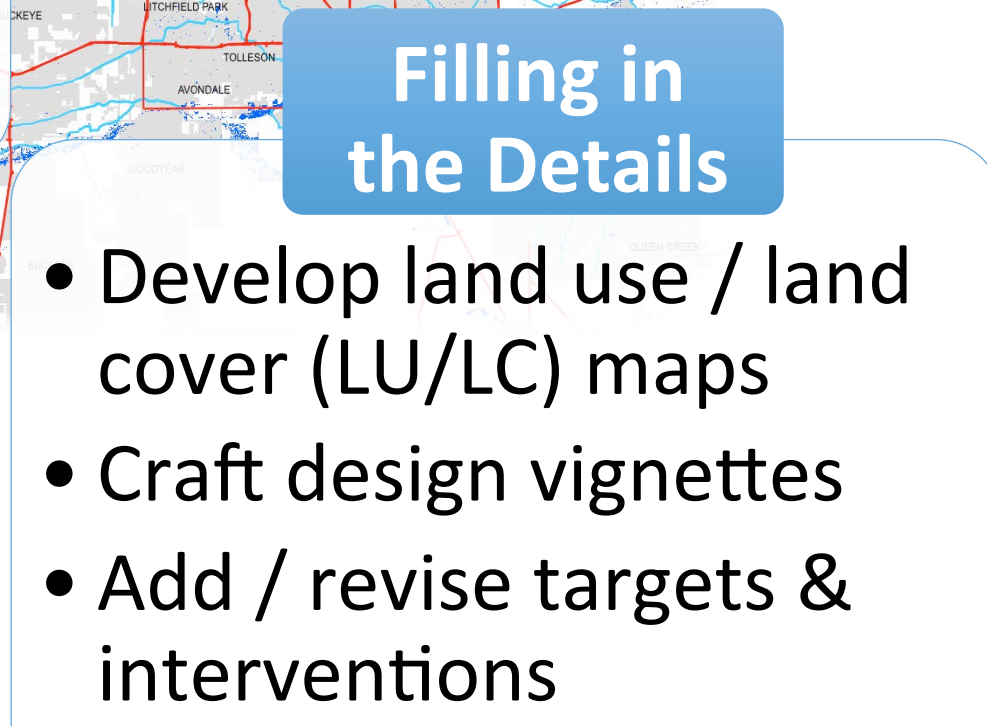
## Defining Core Scenarios:

- Co-develop scenarios on timelines to specify sequence of events
- Forecasted pathways are developed from year 2020 to 2060
- Backcasted pathways are developed from year 2060 to 2020
- ✓ **Outcomes:** Identify scenario goals, pathways, & indicators



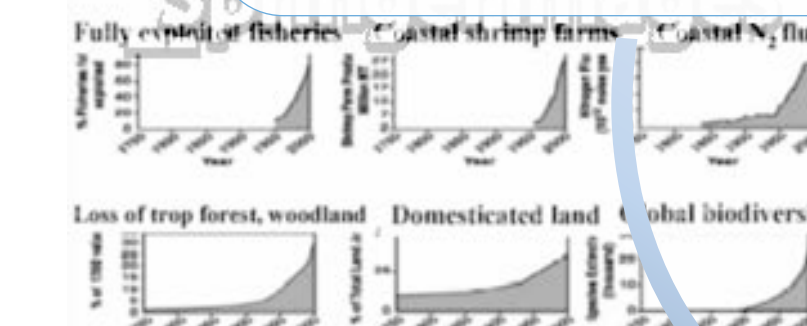
## Filling in the Details:

- Establish consensus on the distinct features of each scenario to better understand what we are comparing & contrasting
- Initiate design-based illustrated vignettes & LU/LC activities
- Add specificity for quantitative modeling & assessments
- ✓ **Outputs:** Refined scenarios, illustrated vignettes & LU/LC maps



## Modeling & Indicators

- Scenario validation
- Exploration of modeled projections
- Selection of scenario indicators



## Modeling, Validation, & Assessments:

- Adaptive & Transformative scenarios are evaluated by CAP LTER modeling teams: water use, water availability, heat, energy, carbon storage
- ✓ **Outputs:** Model simulations & multi-criteria assessments are used to further explore, compare & revise each scenario

## Assessments

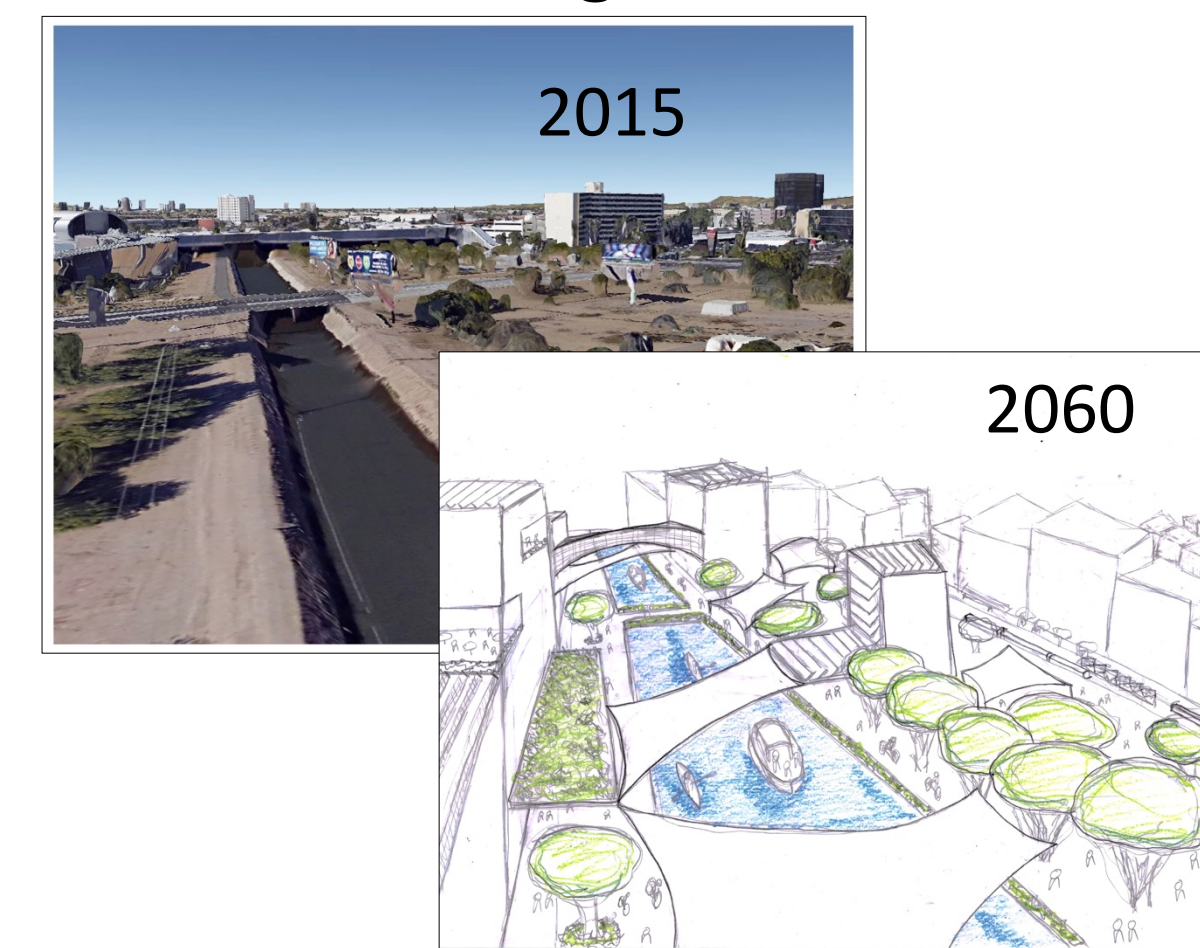
- Sustainability & resilience multi-criteria assessments
- Evaluate & refine scenarios

Products for broader engagement

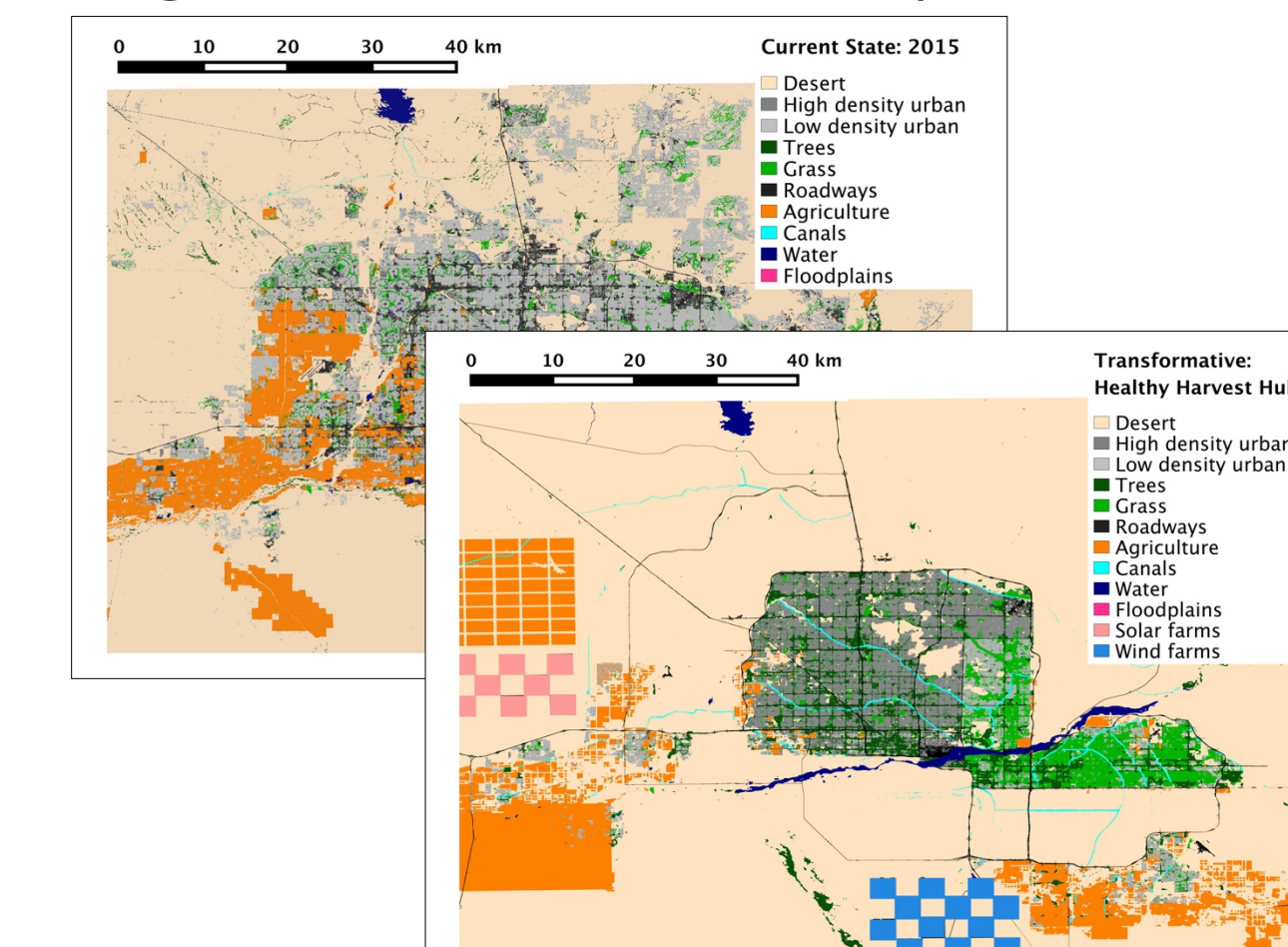
CAP IV & UREx SRN Scenarios

**Sustainable Future Scenarios workflow demonstrating how different types of knowledge are integrated:** Targets & interventions are developed during early workshops & then used to craft vignettes & LU/LC maps for each scenario. Vignettes are used as inputs to Micro-Climature modeling. LU/LC maps are used as inputs to WRF modeling. The impacts & trade-offs of scenarios are then evaluated across scales in multi-criteria assessments.

Human-scale vignettes



Regional-scale LU/LC maps



Statistical Micro-Climature Model: Human-scale heat projections

Weather Research & Forecasting (WRF) Model: Regional scale heat & precipitation projections

Multi-criteria Assessments

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